Chapter 9
WATER PRESERVE AREAS, MIAMI-DADE COUNTY AND NORTH PALM BEACH COUNTY REGIONS

PHYSICAL CONDITIONS - WATER PRESERVE AREAS, MIAMI-DADE COUNTY AND NORTH PALM BEACH COUNTY REGIONS

The Lower East Coast area, which consists of the coastal ridge section in Palm Beach, Broward and Miami-Dade counties, is a strip of sandy land which lies east of part of the Water Conservation Areas (WCAs) (**Figure 8**). The area is made up of the Water Preserve Areas (WPAs), Miami-Dade County and North Palm Beach County regions. The ground surface of the flatlands in the west ranges from about 25 feet NGVD (National Geodetic Vertical Datum) in the upper part of the region to about 5 feet NGVD in lower Miami-Dade County. The Atlantic Coastal Ridge is comprised of broad, low dunes and ridges with elevations ranging from 10 to 25 feet NGVD. This ridge area ranges from 2 – 4 miles in width at its northern edge to its southern edge in Miami. South of Miami the ridge becomes less pronounced but significantly wider.

The Lower East Coast area is the most densely populated part of the state. The largest population centers are near the coast and include the cities of Miami, Fort Lauderdale, Hollywood and West Palm Beach. Water levels in coastal canals are controlled near the coastal shoreline to prevent overdrainage and to prevent saltwater intrusion. Low water levels in these canals may enable saltwater to migrate into the groundwater, wellfields and natural freshwater systems, upon which the urban areas depend for a potable water supply.

This area is characterized by sandy flatlands to the west, the sandy coastal ridge and the coastal marsh and mangrove swamp areas along the Atlantic seaboard. The northern portion, generally that part north of Miami-Dade County, marks the shore of a higher Pleistocene sea and occurs as one or more relict beach ridges. The southern portion appears to be marine deposited sands or marine limestones.

Extensive development has resulted in nearly complete urbanization of the coastal region from West Palm Beach southward through Miami, and physiographical characteristics of the region have been greatly overshadowed. South of Miami, in Miami-Dade County, this coastal area widens as the Everglades bends to the west to include urban areas and agricultural areas that extend almost to the southern coast. Miami-Dade County's agricultural industry covers more than 83,000 acres in the southwest of the coastal metropolitan area. Vegetables, tropical fruits and nursery plants are grown in this area.

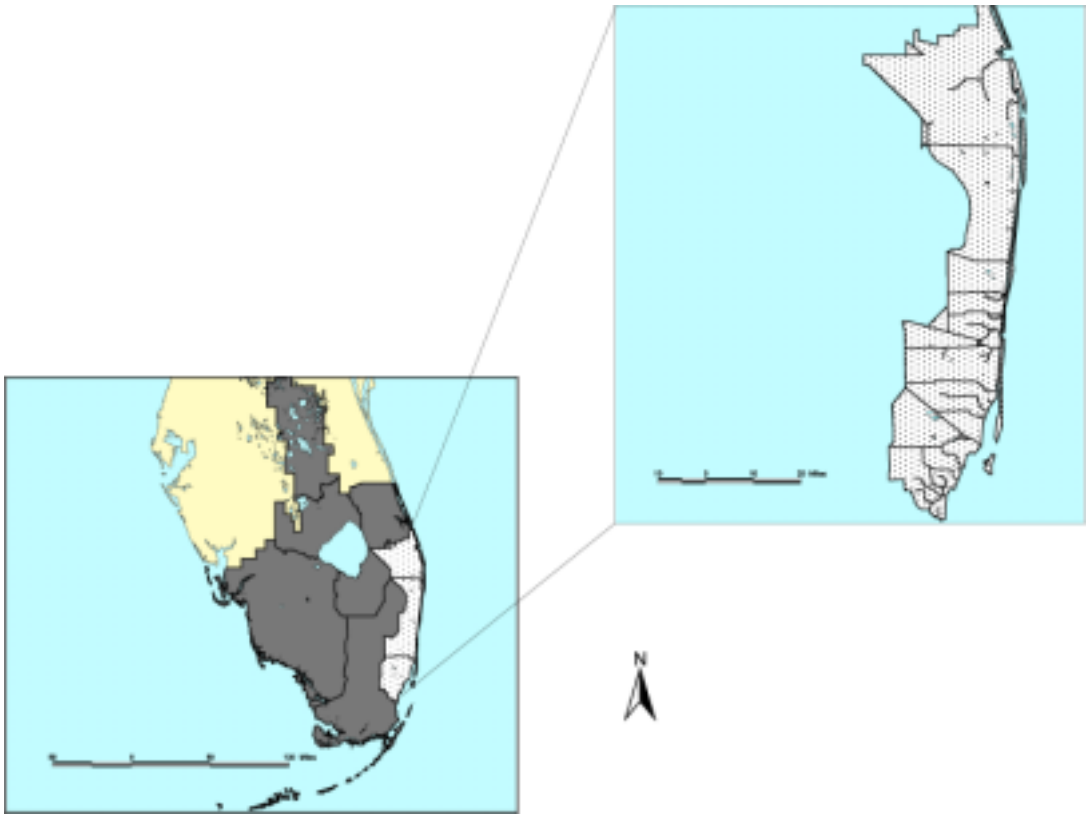

Figure 8. Water Preserve Areas, Miami-Dade County and North Palm Beach County Regions

Biscayne Bay is a shallow, tidal sound located near the extreme southeastern part of Florida. Biscayne Bay, its tributaries and Card Sound are designated by the state of Florida as aquatic preserves, while Card and Barnes sounds are part of the Florida Keys National Marine Sanctuary. A significant portion of the central and southern portions of Biscayne Bay comprise Biscayne National Park.

The original extent of Biscayne Bay approximated 300 square miles, but it has since undergone major modifications, particularly in its northern portions, as a result of development. The bay extends about 55 miles in a south-southwesterly direction from Dumfoundling Bay on the north to Barnes Sound on the south. It varies in width from less than 1 mile in the vicinity of the Atlantic Intracoastal Waterway passage to Dumfoundling Bay, to about 10 miles between the mainland and the Safety Valve Shoals to the east.

While there has been extensive dredging and filling within northern Biscayne Bay, the area still supports a productive and healthy seagrass bed and a few tracts of natural shoreline remain. Northern Biscayne Bay's headwaters are now considered to include dredged areas known as Maule Lake and Dumfoundling Bay, near the northern boundary of Miami-Dade County.

Central and, in particular, southern Biscayne Bay have been impacted less by development than northern bay. For instance, mangrove-lined coastal wetlands extend from Matheson Hammock Park south along the entire shoreline of Biscayne National Park, Card and Barnes Sounds, a distance of approximately 30 miles. These coastal wetlands are the largest tract of undeveloped wetlands remaining in South Florida outside of Everglades National Park (ENP), the Big Cypress National Preserve (BCNP) and the WCAs.

Biscayne National Park, in southern Biscayne Bay was established in 1980 to protect and preserve this nationally significant marine ecosystem consisting of mangrove shorelines, a shallow bay, undeveloped islands and living coral reefs. The park is 180,000 acres in size and 95 percent water. The shoreline of southern Biscayne Bay is lined with a forest of mangroves and the bay bottom is covered with dense seagrass beds. The park has been designated a sanctuary for the Florida spiny lobster. Biscayne Bay and Biscayne National Park support a multitude of marine wildlife, such as lobster, shrimp, fish, sea turtles and manatees. The coral reefs within the Biscayne National Park support a diverse community of marine plant and wildlife.

Depending upon the flood stages reached, all the Central and Southern Florida Flood Control Project (C&SF Project) canals in adjacent Miami-Dade County can carry floodwaters to Biscayne Bay. However, much of the time, discharges from project canals represent primarily runoff or seepage from within the flood protected area of the county. These flows originate in the extensive networks of secondary drainage canals and storm sewers that discharge into the project canals. Supplementing the complex system of project canals and secondary drainage systems are many hundreds of other storm water drainage canals and storm sewer outfalls within Miami-Dade County that discharge freshwater directly into Biscayne Bay.

EXISTING CONDITIONS - WATER PRESERVE AREAS, MIAMI-DADE COUNTY AND NORTH PALM BEACH COUNTY

This Region functions as a multipurpose canal system with several objectives including: flood control, urban water supply, industrial water supply, agriculture water use, protection and enhancement of wetland and estuarine systems, prevention of saltwater intrusion and recreation. The Lower East Coast system is capable of moving vast quantities of water during the wet season, as well as supplying water (if available) during the dry season or as needed. Important freshwater canals are, from north to south, C-44, C-18, C-17, C-51, Hillsboro Canal, North New River Canal, Miami Canal, New River Canal, C-9, C-8, C-7, C-4, C-100, C-100c, C-1, C-102, C-103, C-109, C-110, C-111 and the South Miami-Dade Conveyance System.

Approximately half of the acreage farmed in the Lower East Coast is irrigated (UFBEBR, 1995). This region is highly dependent on the system of canals, levees and other structures for flood control in the wet season and water supply in the dry season. Providing adequate drainage and flood control to the South Miami-Dade County agricultural area is a serious challenge because the farmland is directly adjacent to ENP.

Evidence suggests that efforts to provide flood control to agriculture have resulted in over-drying the eastern portions of ENP and adversely affecting park ecology. Agricultural land does, however, provide a buffer between urbanization and Everglades National Park. Farmland is recognized as the preferred neighbor to natural areas because of its minimal impervious areas, open green space and low population density. A strong agricultural economy in the Lower East Coast Region based on profitable crop production is the best defense against conversion of agricultural land to urban land.

The major estuaries in the Lower East Coast Region are Lake Worth Lagoon in Palm Beach County, West Lake in Broward County and Biscayne Bay in Miami-Dade County. Lake Worth Lagoon was predominantly a freshwater system as recent as 100 years ago but was converted into a marine system with construction of permanent inlets to the ocean. West Lake is 1,400 acres of coastal wetland and mangroves in Hollywood along the Intracoastal Waterway. Biscayne Bay is a subtropical lagoon about 40 miles long that extends the length of Miami-Dade County.

Prior to urban development, freshwater discharge to Biscayne Bay consisted of flows through natural drainageways, overland flow and groundwater discharge from the Biscayne aquifer. However, the flow has changed from short bursts of rainy season flow through low drainageways, to regulated releases through drainage canals and decreased periods of groundwater discharge (SFWMD, 1995). The construction of the canal system lowered the regional water table and subsequently reduced the amount of groundwater flow into the bay. groundwater discharge into Biscayne Bay is believed to occur through both seepage and flow through subsurface leakage channels. A zone of seepage occurs around the perimeter of the bay where the water table elevation is higher than sea level. Subsurface flow occurs through natural leakage channels in the rock formations. Prior to the construction of drainage canals, springs flowed along the shore and emanated from the bottom of the bay. However, present day rates of groundwater discharge into the bay are insufficient to produce such flowing springs (SFWMD, 1995).

Surface water flows into Biscayne Bay and Lake Worth Lagoon are primarily controlled by the system of canals, levees and control structures built as part of the Central and South Florida Flood Control Project. Biscayne Bay receives freshwater surface flows from 17 surface water basins through 12 major coastal structures (SFWMD, 1995). Lake Worth Lagoon's freshwater input is principally from the C-51 Canal. The mechanism of surface water flow into Biscayne Bay and Lake Worth Lagoon are short intense pulses of freshwater discharged at discrete locations. This flow has replaced the historic sheetflow through the wetlands adjacent to the bay that existed before development of the canal system. Dry season flows into these water bodies are much lower than predrainage levels because most of the discharge into the bay is from storm water releases from the canals. The canal discharge can bring sediments, heavy metals, pesticides, fertilizers, herbicides, nutrients and low salinity plumes, which can all adversely affect the biota (SFWMD, 1995).

FUTURE WITHOUT PLAN CONDITION - WATER QUALITY - WATER PRESERVE AREAS, MIAMI-DADE COUNTY AND NORTH PALM BEACH COUNTY

The major watershed management/planning program ongoing in the Lower East Coast Region that will beneficially effect future water quality conditions is the state's Biscayne Bay Surface Water Improvement and Management (SWIM) Plan (SFWMD, 1995). The Biscayne Bay SWIM Plan has developed numerous water quality improvement related strategies and projects to reduce pollutant loading in Biscayne Bay and its tributaries. The extent to which this program is implemented, however, is limited due to funding constraints. Also, the Lake Worth Lagoon Management Plan will result in water quality improvement projects being implemented in the area. Although implementation of these water quality improvement activities will result in beneficial effects to Lower East Coast water bodies, the net future condition of water bodies in this region is not expected to improve due to the dramatic additional urban development, and associated additional pollutant loads, projected to occur in this region.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - PROJECTS

C-51

The current Design Memorandum was completed in February 1998 and submitted for review and approval and contains the same National Economic Development plan as the June 1992 Detailed Design Memorandum but references an “authorized” plan, which includes the replacement of the 2.5 square mile detention area with Stormwater Treatment Area (STA) 1E from the Everglades Construction Project (ECP). The “authorized” plan is also a product of the Technical Mediated Plan, which has been agreed to by the United States Department of Justice, United States Department of Interior (USDOI), United States Department of Army, the state of Florida and the South Florida Water Management District (SFWMD or District). The state of Florida's Everglades Forever Act is based, in part, on the Technical Mediated Plan. The current “authorized” plan was authorized by the Water Resources and Development Act of 1996. The Act included language for the Western C-51 Project that additional work, as described in the ECP, shall be accomplished at full federal cost.

The authorized plan is recommended in the C-51 Design Memorandum and has many of the same physical features proposed in the 1992 Detailed Design Memorandum (described below). The project will provide 10-year flood protection for the western basin of C-51. The major physical difference between the 1992 Detailed Design Memorandum National Economic Development plan and the authorized plan is the replacement of the 1,600 acre detention area with the 5,350 acre “locally preferred” STA 1 East. The most significant modification will be the reduction of discharges to Lake Worth, with C-51 West Basin runoff directed instead to WCA-1 (Arthur R. Marshall Loxahatchee Wildlife Refuge). Runoff from the C-51 West Basin will pass through STA 1 East for water quality improvement prior to its discharge to WCA-1. In addition to the flood damage reduction

benefits provided by the 1992 plan, the authorized plan would provide water quality improvement, reduction of damaging freshwater discharges to Lake Worth, and increased water supply for the Everglades and other users.

Northwest Dade Lake Belt Area

This component assumes that the conditions caused by the currently permitted mining exist and that the affects of any future mining are fully mitigated by the mining industry.

C-111 Project

Plan 6a, recommended in the United States Army Corps of Engineers (USACE) General Reevaluation Report (dated May 1994), will create the operational capability and flexibility to provide restoration of the ecological integrity of Taylor Slough and the eastern panhandle areas of the Everglades and maintain flood protection to the agricultural interests adjacent to C-111.

In the future without plan condition, C-111 Plan 6a will protect the natural values of a portion of Everglades National Park, and will maintain flood damage prevention within the C-111 Basin, east of L-31N and C-111. The project, which consists of both structural and nonstructural modifications to the existing project works within the C-111 Basin, will restore the hydrology in 128 square miles of Taylor Slough and its headwaters in the Rocky Glades. In addition, the hydroperiod and depths in 1,027 square miles of Shark River Slough are beneficially impacted by the higher stages in the Rocky Glades, resulting in a net increase in water volume within Shark River Slough. The project will provide adequate operational flexibility to incorporate management strategies that will evolve as a result of continued monitoring and studies.

Modified Water Deliveries to Everglades National Park

As of this writing, the Modified Water Deliveries to Everglades National Park Project is on hold pending the resolution of litigation involving the U.S. Army Corps of Engineers. The project is expected to resume once the litigation is resolved.

The Modified Water Deliveries to Everglades National Park Project was authorized by the Everglades National Park Protection and Expansion Act (Public Law 10229). The purpose of the project is to provide for structural modifications to the C&SF Project to enable the restoration of more natural water flows to Shark River Slough in Everglades National Park. The project is being implemented by the USACE in conjunction with the acquisition of about 107,600 acres of land by the USDOI. Land acquisition for the levee, canal, and pump station for the flood mitigation system in the 8.5 Square Mile Area is underway.

This project is presently in the design and construction phase. Project construction is scheduled for completion in 2003. In the future without plan condition, the Modified Water Deliveries Project will provide more natural flows to Shark River Slough in Everglades National Park. Water flows will be spread across a broader section of Shark River Slough to include the east Everglades between L-67 Extension and L-31N.

The addition of water control structures and culverts will help to reestablish the natural distribution of water from WCA-3A into WCA-3B. Outlets from WCA-3B (S-355A & B) will be constructed to discharge into Northeast Shark River Slough. An existing levee and canal (L-67 Extension) along the eastern edge of the existing Everglades National Park boundary will also be removed. A Miccosukee Indian camp has been flood-proofed to avoid periodic flooding that would otherwise be caused by the project.

In order to prevent adverse flood impacts to the 8.5 Square Mile Area, the authorized project includes the construction of a seepage levee and canal around the western and northern edges of the area and a pump station (S-357) to remove excess seepage water. These project features are designed to maintain the existing level of flood protection in the residential area after the Modified Water Deliveries to Everglades National Park project returns water levels in Northeast Shark Slough to higher levels. A second pump station (S-356) will be constructed to pump excess seepage water from the L-31N Borrow Canal and residential area into the L-29 Borrow Canal. This water will then flow through culverts under US Highway 41 into Northeast Shark River Slough. A locally preferred option that would modify the project features in the 8.5 Square Mile Area is currently under consideration.

The structural modifications were designed to provide for maximum operational flexibility so that as more is learned through the continued iterative testing program, the operation of the project can be adjusted accordingly.

East Cape and Homestead Canals

The East Cape and Homestead canals, located within Everglades National Park, were constructed by local interests in the early 1900s to assist in the drainage of the Everglades prior to authorization of the park in 1936. After the Everglades National Park was established, the canals were plugged to prevent overdrainage of upstream freshwater systems and saltwater intrusion during high tides in the dry season. The passage of Hurricane Andrew resulted in extensive damage to both plugs. The project repaired the plugs in August 1997.

Interim Plan for Lower East Coast Regional Water Supply

The Interim Plan for Lower East Coast Regional Water Supply, produced by the SFWMD, identified water resources and water supply development projects, both structural and nonstructural, to help meet the growing needs of the region (SFWMD,

1998d). The Interim Plan also identified local basin planning and other analytical programs to support the Lower East Coast 2020 Plan development and the Restudy.

The analyses conducted during the Lower East Coast Regional Water supply planning process demonstrated the need for increased storage capabilities throughout the system to help meet the increasing agricultural, environmental and urban demands.

Wellfield Expansion in Service Areas 1 and 2

This component provides for relocation of future and some existing withdrawals from existing (1995) wellfields. Demands of the following utilities were evaluated assuming new wellfield locations: Lake Worth, Manalapan, Lantana, Boca Raton, Fort Lauderdale, Hollywood and Hallandale. The evaluations assumed that, for these utilities, demands shifted to new wellfields were the same as those identified in the Draft Lower East Coast Regional Water Supply Plan (SFWMD, 1997g). Generally this means that 1995 levels of demands continued to be met from existing facilities while the portion of new demands beyond 1995 levels were met from the newly expanded wellfields. The new wellfields were generally evaluated as being located along the western boundary of each utility's service area.

Northeastern Broward Secondary Canal Recharge Network

This component includes pump stations and structures that would maintain higher levels in secondary canals in eastern Broward County between the Hillsboro and the North New River canals during the dry season. The control of seasonally higher canal elevations along the coast could help recharge the aquifers being used by local public water supply wellfields, and further reduce saline encroachment into the coastal freshwater aquifers. The selected canals are located where recharge from the canals would help to hold back the saltwater front and protect the production capability of wellfields to the east.

Miami-Dade County Utility Aquifer Storage and Recovery (ASR)

This component includes ASR wells and related facilities that would be installed associated with wellfields of the Miami-Dade Water and Sewer Authority Department. These facilities would be operated to store water in the Floridan aquifer in the wet season and recover this water in the dry season. For the future without project condition, the evaluations were for a daily injection and recovery capacity of approximately 150 million gallons per day (MGD), a maximum recovery percentage of injected water of 90 percent, an annual injection period of seven months and an annual recovery period of five months.

Selected Elements of L-8 Project

The goal of the selected elements of the L-8 project is to redirect runoff from the southern L-8 Basin away from WCA-1 and the C-51 Canal to the West Palm Beach Water Catchment Area and the Loxahatchee Slough via the M Canal and the C-18 Canal.

Subsequently, this water may be used to meet urban water supply demands for West Palm Beach, to meet environmental water demands of the West Palm Beach Catchment Area and Loxahatchee Slough, and may provide recharge for the Jupiter and Seacoast Utilities Authority wellfields. In addition, this project would be expected to reduce the incident and volume of harmful freshwater releases into Lake Worth Lagoon via the C-51 Canal. The project includes: an improved structural connection from the West Palm Beach Water Catchment Area to the Loxahatchee Slough ASR wells at the West Palm Beach Water Catchment Area or the Indian Trails Improvement District impoundment and a coastal recharge delivery system.

Minimum Flows and Levels (MFLs)

This component involves operational adjustments associated with the establishment of minimum flows and levels (MFLs) for the Biscayne aquifer and the Everglades. Minimum levels for the Biscayne aquifer involves maintaining water levels in coastal canals to prevent saltwater intrusion. MFLs for the Everglades focuses on preservation of hydric soils. No net outflow from WCAs are allowed if water levels are less than minimum level marsh triggers or less than minimum operating criteria in the canals of the Loxahatchee National Wildlife Refuge (WCA-1): 14 feet, WCA-2A: 10.5 feet, WCA-3A: 7.5 feet. Marsh level triggers will be those used in the Interim Plan for Lower East Coast Regional Water Supply.

FUTURE WITHOUT PLAN CONDITION - PHYSICAL FACILITIES AND OPERATIONS - CRITICAL RESTORATION PROJECTS

C-4 Water Control Structure

This project involves construction of a gated control structure (S-380) in the C-4 canal at the congruence with the Dade-Broward Levee. A large volume of seepage is lost from WCA-3B to the coast because the existing water management system cannot raise surface and groundwater levels high enough to prevent seepage. Construction of a gated control structure with five 72-inch diameter culverts with remotely operated slide gates will increase aquifer recharge and surface and subsurface storage of water to reduce seepage, as well as enhance habitat for plants and animals. The total cost is estimated at $1.3 million according to the project cooperation agreement entered into by the SFWMD and the USACE on January 7, 2000. More information is available regarding this critical project at www.saj.usace.army.mil/projects/index.html.

Western C-11 Water Quality Improvement

The purpose of this project is to improve the quality and timing of storm water discharges from the Western C-11 Basin to the Everglades Protection Area. The S-9 Pump Station currently pumps urban and agricultural storm water runoff from the Western C-11 Basin directly into WCA-3A. This project will be completed in two phases. Phase 1 will

involve installation of four new seepage return pumps adjacent to the S-9 Pump Station. Phase 2 will involve construction of a new divide structure in the C-11 canal, approximately 0.5 miles east of US Highway 27. Seepage return pumps will include two 75-cfs electric pumps and two 175-cfs diesel pumps. The divide structure will be a gated concrete spillway with a discharge capacity of 2,880 cfs. During non-flood conditions, the new structure is intended to separate seepage from storm water runoff, allowing return of relatively clean seepage waters to WCA-3A using the new seepage return pumps. The estimated cost of the project is $9.6 million according to the project cooperation agreement entered into by the SFWMD and the USACE. Additional information is available at www.saj.usace.army.mil/projects/index.html.

WATER QUALITY PROBLEMS AND OPPORTUNITIES

For planning purposes, the Lower East Coast consists of Water Preserve Areas, North Palm Beach County and Miami-Dade County Regions, including Biscayne Bay and Lake Worth Lagoon. According to the Florida Department of Environmental Protection's (FDEP) 1998 303(d) list, approximately 42 water body segments (both fresh and marine water bodies) within the Lower East Coast are use-impaired. Pollutants/water quality constituents causing impairment include low levels of dissolved oxygen (DO), high levels of mercury (based on fish consumption advisories) and other trace metals, and high levels of coliform bacteria, total suspended solids (TSS), biochemical oxygen demand (BOD) and un-ionized ammonia.

Four of the main C&SF Project canals delivering flows from Lake Okeechobee and the WCAs (the West Palm Beach, Hillsboro, New River and Miami canals) traverse the Lower East Coast. In addition to conveying Lake Okeechobee and WCA flows, the C&SF Project canals and a network of connecting secondary and tertiary canals provide drainage in the Lower East Coast, which conveys storm water runoff and attendant pollution loads to estuarine waters. Management of storm water runoff and flooding via the existing canal system has been implicated as the chief cause of water quality degradation in the region, particularly in the northern portion of Biscayne Bay.

Improving water quality in the Lower East Coast to meet water quality standards in all impaired water bodies will likely be difficult, considering the extent of urban development, minimal or nonexistent water quality treatment for nonpoint source runoff, and other direct (point source) and indirect discharges adversely affecting water quality in the Lower East Coast. Water quality conditions are expected to worsen in the Lower East Coast (central and southern Palm Beach, Broward and Miami-Dade counties) by 2050 compared to current conditions. FDEP's 1996 Section 305(b) report to the United States Environmental Protection Agency (USEPA) describing water quality conditions in the region indicates that most of the region exhibits "fair" or "good" water quality. The report goes on to state that most pollution (in the region) comes from storm water, although bacteriological contamination from wastewater discharges and septic tanks is also a significant problem, particularly in the Miami River, downstream in Biscayne Bay, and urban areas west of the intracoastal waterway in Broward County and north of the New River. Water quality conditions in receiving water bodies in 2050 are expected to be

further degraded, due to the developed condition of the watershed and the continued accumulation of pollutants in sediments in receiving water bodies.

Nearly all of this heavily urbanized watershed drains to estuarine waters. Net pollution loads, especially from nonpoint sources, to receiving waters in the Lower East Coast are expected to increase as a result of projected population increases. The expected increase in net pollution loads may not be directly proportional to population growth. New growth and urban/suburban development in the Lower East Coast must comply with water quality treatment requirements for nonpoint source runoff, whereas much of the existing development in the Lower East Coast does not include facilities for treatment of nonpoint pollution sources. Nevertheless, the projected addition of approximately 2.7 million people to the region is expected to cause water quality conditions to be further degraded, especially in those basins which are already stressed by existing pollution loads.

In Palm Beach County, the Lake Worth Lagoon Estuary is the receiving water body for most of that urban watershed. There are approximately eight use-impaired water bodies in Palm Beach County on the FDEP 1998 303(d) list. Listed water body segments include coastal canals and freshwater areas further inland. Water quality conditions are expected to improve (in terms of estuarine salinity targets) as a result the C-51 (STA 1 East) Project, which will divert freshwater discharges to Lake Worth Lagoon to a treatment area prior to discharge to WCA-1. However, net nonpoint source pollution loads to Lake Worth Lagoon may increase commensurate with increases in population and development.

Although there are no extensive estuarine water bodies in Broward County, remaining mangroves in southern Broward County canals and along the Intracoastal Waterway provide similar habitat. There are approximately 21 303(d)-listed use-impaired water body segments in Broward County. These water body segments are primarily coastal canals providing drainage. Due to the extent of existing urban development in the watersheds of those canals, it is not likely that there will be a significant increase in future nonpoint source pollution loads into these water bodies. However, it is also unlikely that basin-wide storm water best management practices (BMPs), e.g., retention/detention facilities, and filtration, can be implemented effectively in heavily urbanized watersheds, due to the lack of available land for such facilities. Future basin planning efforts during TMDL development and implementation may result in more effective controls of other direct (point source) and indirect discharges of pollutants (e.g., car washes and other industrial facilities). At best, the long-term prognosis for improving all use-impaired water bodies in coastal areas of Broward County is uncertain.

In Miami-Dade County, approximately 13 water body segments were identified as use-impaired on the FDEP's 1998 303(d) list. Most are coastal canals providing drainage of runoff to Biscayne Bay. Biscayne Bay is the largest estuarine water body in the Lower East Coast, and is the receiving water body for most of the developed area of Miami-Dade County. Most of Biscayne National Park is located within the central and southern portion of the Biscayne Bay Estuary. As with some of the Broward County canals, controlling nonpoint sources of runoff in heavily urbanized areas in Miami will be difficult, due to the lack of available land for basinwide BMPs. Some incremental improvement of nonpoint

source pollution loads may be realized through the basin management plans to be developed by the FDEP. Point sources and other direct discharges of pollutants to Biscayne Bay and tributary canals should be significantly improved if basin management plans are fully implemented. However, overall, it is not expected that water quality in coastal canals draining to Biscayne Bay will be improved to the point that all surface water quality standards will be achieved. Furthermore, any water quality benefits achieved as a result of the Biscayne Bay SWIM Plan may be offset by increases in nonpoint source pollution loads associated with projected population increases.

LAND USE - WATER PRESERVE AREAS, MIAMI-DADE COUNTY AND NORTH PALM BEACH COUNTY

Agriculture

Broward and Miami-Dade counties are included in this area. Although Palm Beach County is also a part of this area physiographically, agriculture issues for Palm Beach County were addressed within the Everglades Agriculture Area Region (**Chapter 7**). More than 100,000 acres are farmed in Broward and Miami-Dade counties (UFBEBR, 1995), and are characterized by small farms averaging less than 50 acres, with very high productivity of more than $3,500 per acre (UFBEBR, 1995). A variety of crops are produced including vegetables, tropical fruits and nursery plants. Hurricane Andrew, which struck southern Miami-Dade County in 1992, caused significant damage to agricultural areas. Many fruit tree orchards were damaged or destroyed. Statistics from 1996 indicate that avocado production had recovered, but mango and lime orchards had not yet recovered from the hurricane damage (FASS, 1997b). Total acres of tropical fruit production in Miami-Dade County remain approximately 7,000 less than pre-hurricane levels (FASS, 1996e). Foliage plant production is also a major business in Broward and Miami-Dade counties. More than 120 million square feet were devoted to the foliage crop in Broward, Miami-Dade and Palm Beach counties in 1996 (FASS, 1997a).

Agricultural production and services employ approximately 18,000 people in this region representing a $23 million payroll (UFBEBR, 1995). The total market value of agricultural products from this region is almost $400 million (UFBEBR, 1995). Miami-Dade County ranks second in the state for total market value of agricultural products (UFBEBR, 1995).

Approximately half of the acreage farmed in the three region area is irrigated (UFBEBR, 1995). This region is highly dependent on the system of canals, levees and other structures for flood control in the wet season and water supply in the dry season. Providing adequate drainage and flood control to the south Miami-Dade County agricultural area is a serious challenge because the farmland is directly adjacent to Everglades National Park. Evidence suggests that efforts to provide flood control to agriculture have resulted in over-drying the eastern portions of Everglades National Park adversely affecting Park ecology. Agricultural land does, however, provide a buffer between urbanization and Everglades National Park. Farmland is recognized as the preferred neighbor to natural areas because of its minimal impervious areas, open green

space and low population density. A strong agricultural economy in the Lower East Coast Region based on profitable crop production is the best defense against conversion of agricultural land to urban land.

Urban

The Lower East Coast supports the densest population in the state of Florida. Population in the Lower East Coast is expected to increase by 35 percent, from 4,518,401 in 1995 to 6,825,600 (BEBR, 2002) in 2020. Land use in the Lower East Coast is primarily related to urban activities and the infrastructure, such as transportation and utilities, needed to support this large number of people. Urban demands are expected to increase by 39 percent by 2020. If however, the Lower East Coast experiences a in-10 year drought during the planning period, than the projected urban and agricultural demand will increase about 43 percent.

South Miami-Dade County is defined as the area south of SW 184th St. (Eureka Drive). US Highway 1 bisects the area. West of US 1, land uses are primarily estate and low-density residential uses within the Urban Development Boundary (UDB). Other higher density residential uses, business/office and industrial uses are found in Homestead and Florida City. The Redlands and other agricultural areas are west across the UDB and make up most of the approximately 55,000 acres of agricultural lands that remain in south Miami-Dade County. The Urban Expansion Area designation identifies agricultural lands in south Miami-Dade County as the next place for development.

Miami-Dade and Broward counties have the most pronounced sprawl patterns. The South Florida Regional Planning Council (SFRPC) describes the change:

> Essentially rural areas in the western extremes of Broward and Miami-Dade counties have given way to sprawling suburban residential development and shopping centers. Indeed, these have been an important component of the economic growth that has taken place in the region. During the process, the once significant rural population has virtually disappeared, resulting in the emergence of a distinctly urban character to the region. Miami-Dade County was already 94 percent urban in 1950, and 77 percent of Broward County's population lived in urban areas. By 1980, both counties were 99 percent urban. Only in Monroe County did a significant portion of the population still live outside of urban areas in 1990 (27 percent), consistent with the special characteristics of that county's political geography (SFRPC, 1996).

Palm Beach County is experiencing a similar change. The Treasure Coast Regional Planning Council (TCRPC) reports that while the coastal area of Palm Beach County from Riveria Beach to Boca Raton, is heavily urbanized, much of the recent population growth has occurred in the western unincorporated areas (TCRPC, 1996). This sprawling urbanization tended to push agricultural land uses off of prime farmlands into the less suitable wetlands fringing the coastal ridge. As the development continues to expand it is expected that it will consume the remaining agricultural lands (both historic and recent) and eventually make its way into the remaining unprotected wetlands of the

counties. The SFRPC explains that the region, in the response to the pressure of continued population growth, is likely to yield to the pressure to continue to urbanize.

Additional Lower East Coast urban-related land uses include the Florida Power and Light nuclear power plant at Turkey Point, landfills, rock mining, the former Homestead Air Force Base site, and a number of marinas scattered throughout Biscayne Bay and Lake Worth Lagoon.

Increased Pressure on Open Land

As development continues the availability of developable land decreases putting pressure on the unprotected wetlands and agricultural lands. There is a fear that agriculture lands will come under increased pressure as lands are converted into subdivisions or set aside for environmental protection. South Miami-Dade County typifies this trend. As people continue to move into the county pushing the north and central regions to capacity, the remaining undeveloped areas in south Miami-Dade County become the easiest option for future growth. The 80,000 acres of agricultural lands in the Redland Region and other parts of unincorporated Miami-Dade County are increasingly under development pressure. In the 1995 Evaluation and Appraisal Report Miami-Dade included a recommendation that a Farmland Retention Study be conducted, noting that:

> By [the Evaluation and Appraisal Report for 2000] the currently planned Urban Development Boundary will be substantially built out and the County will be facing the prospect of having to plan for the urbanization of an additional 20 square miles of land, if we continue the past trend of low-density development.

There are several other efforts to halt these land conversion and development trends including the following: Eastward Ho!, Brownfields and the South Miami-Dade U.S. 1 Corridor Project.

ELIGIBLE COMPREHENSIVE EVERGLADES RESTORATION PLAN (CERP) PROJECTS

North Palm Beach County Project - Part 1

This project consists of six separable elements including: Pal-Mar and J.W. Corbett Wildlife Management Area Hydropattern Restoration, L-8 Basin Modifications, C-51 and Southern L-8 Reservoir, Lake Worth Lagoon Restoration, C-17 Backpumping and Treatment and C-51 Backpumping and Treatment. These separable elements have been combined into a single project to address the interdependencies and trade-offs between the different elements. The elements provide a more efficient and effective design of the overall project. More detailed information is available at www.evergladesplan.org.

Acme Basin B Discharge

This project includes construction of a wetland or chemical treatment area and a storage impoundment with a combined total storage capacity of 3,800 acre-feet located adjacent to the Loxahatchee National Wildlife Refuge in Palm Beach County. The initial design for the treatment area and impoundment assumed 310 acres with water levels fluctuating up to 4 feet above grade and 620 acres with the water levels fluctuating up to 8 feet above grade. The final size, depth and configuration of these facilities will be determined through more detailed planning and design. The purpose of this separable element is to provide water quality treatment and storm water attenuation for runoff from Acme Basin B prior to discharge to the Loxahatchee National Wildlife Refuge or alternative locations. Excess available water may be used to meet water supply demands in central and southern Palm Beach County. More detailed information is available at www.evergladesplan.org.

Strazzulla Wetlands

This project includes water control structures and the acquisition of 3,335 acres located in Palm Beach County. The purpose of this separable element is to provide a hydrological and ecological connection to the Loxahatchee National Wildlife Refuge and expand the spatial extent of protected natural areas. This land will act as a buffer between higher water stages to the west and lands to the east that must be drained. The increase in spatial extent will provide vital habitat connectivity for species that require large unfragmented tracts of land for survival. It also contains the only remaining cypress habitat in the eastern Everglades and one of the few remaining sawgrass marshes adjacent to the coastal ridge. This is a unique and endangered habitat that must be protected. This area provides an essential Everglades landscape heterogeneity function. More detailed information is available at www.evergladesplan.org.

Palm Beach County Agricultural Reserve Reservoir - Part 1

This project includes an above ground reservoir with a total storage capacity of approximately 20,000 acre-feet located in the western portion of the Palm Beach County Agricultural Reserve. The purpose of this project is to supplement water supply deliveries for central and southern Palm Beach County by capturing and storing excess water currently discharged to the Lake Worth Lagoon. These supplemental deliveries will reduce demands on Lake Okeechobee and the Loxahatchee National Wildlife Refuge area. It is assumed that this facility could also be designed to achieve water quality improvements in downstream receiving waters, depending upon pollutant loading conditions in the watershed. More detailed information is available at www.evergladesplan.org.

Site 1 Impoundment

This project includes an above ground reservoir with a total storage capacity of approximately 15,000 acre-feet located in the Hillsboro Canal Basin in southern Palm

Beach County. The purpose of this project is to supplement water deliveries to the Hillsboro Canal during dry periods thereby reducing demands on Lake Okeechobee and the Loxahatchee National Wildlife Refuge. Water from the Hillsboro Canal will be pumped into the reservoir during the wet season or periods when excess water is available. Water will be released back to the Hillsboro Canal to help maintain canal stages during the dry-season. More detailed information is available at www.evergladesplan.org.

Broward County WPA

The Broward County WPA project is comprised of several Comprehensive Plan components. The components are the C-11 Impoundment, the C-9 Impoundment and the Water Conservation Area 3A/3B Levee Seepage Management component. More detailed information is available at www.evergladesplan.org.

Eastern C-4 Structure

This project includes two water control structures located in the C-4 Canal in Miami-Dade County. The purpose of this project will be to enhance wetland hydroperiods and enhance recharge to Miami-Dade County's Northwest Wellfield. The eastern structure will be operated to reduce regional system deliveries by diverting dry season storm water flows to the C-2 Canal to provide saltwater intrusion protection and recharge to downstream wellfields. A western structure, being implemented under the Critical Projects Program, will be operated to control water levels in the C-4 Canal at a higher elevation to reduce seepage losses from the Pennsuco Wetlands and areas to the west of the structure. More detailed information is available at www.evergladesplan.org.

WPA Conveyance

This project is comprised of parts of three CERP components. These include Dade Broward Levee and Canal, North Lake Belt Storage Area (Turnpike Deliveries) and Central Lake Belt Storage Area (L-30 Improvements). The purpose of this project is to, among other things, reduce seepage to the east from the Pennsuco wetlands and southern WCA 3B, enhance hydroperiods in the Pennsuco Wetlands, provide recharge to the Miami-Dade County's Northwest Wellfield, convey regional water supply deliveries south to Miami-Dade County and convey regional natural system deliveries to the Northeast Shark River Slough. More detailed information is available at www.evergladesplan.org.

Broward County Secondary Canal System

This project includes a series of water control structures, pumps and canal improvements located in the C-9, C-12 and C-13 Canal Basins and east basin of the North New River Canal in central and southern Broward County. The purpose of this project is to reduce water discharges by recharging local wellfields and stabilizing the saltwater interface. Excess water in the basins will be pumped into the coastal canal systems to maintain canal stages at

optimum levels. When basin water is not sufficient to maintain canal stages, the canals will be maintained from other construction projects, such as the (Site1) Impoundment and the North Lake Belt Storage Area and then from Lake Okeechobee and the Water Conservation Areas. More detailed information is available at www.evergladesplan.org.

Wastewater Reuse Technology Pilot Project

Currently, two CERP projects involve the advanced treatment of wastewater. This pilot project will address water quality issues associated with discharging reclaimed water into natural areas, such as the West Palm Beach Water Catchment Area, Biscayne National Park and the Bird Drive Basin, the project will also determine the level of superior treatment and the appropriate methodologies for that treatment. A series of studies will be conducted to help determine the level of treatment needed. CERP will also monitor an existing reuse site in West Palm Beach and apply the data to potential reuse sites in West Miami-Dade. The research associated with West Palm Beach and West Miami-Dade will be performed under Part 1 of the pilot project. Part 2 of the pilot project will involve construction at a pilot facility in South Miami-Dade. More detailed information is available at www.evergladesplan.org.

Biscayne Bay Coastal Wetlands

This project includes pump stations, spreader swales, stormwater treatment areas, flowways, levees, culverts and backfilling canals located in southeast Miami-Dade County and covers 13,600 acres from the Deering Estate at C-100C, south to the Florida Power and Light Turkey Point power plant, generally along L-31E. The purpose of this project is to rehydrate wetlands and reduce point source discharge to Biscayne Bay. Through a spreader system, this project will replace lost overland flow and partially compensate for the reduction in groundwater seepage by redistributing available surface water entering the area from regional canals. More detailed information is available at www.evergladesplan.org.

Bird Drive Recharge Area

This project includes pumps, water control structures, canals and an above ground recharge area with a total storage capacity of approximately 11,500 acre-feet located in western Miami-Dade County. The purpose of this project is to recharge groundwater and reduce seepage from the Everglades National Park buffer area by increasing water table elevations east of Krome Avenue. The facility will also provide C-4 flood peak attenuation and water supply deliveries to the South Dade Conveyance System and Northeast Shark River Slough. More detailed information is available at www.evergladesplan.org.

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